FIG.1

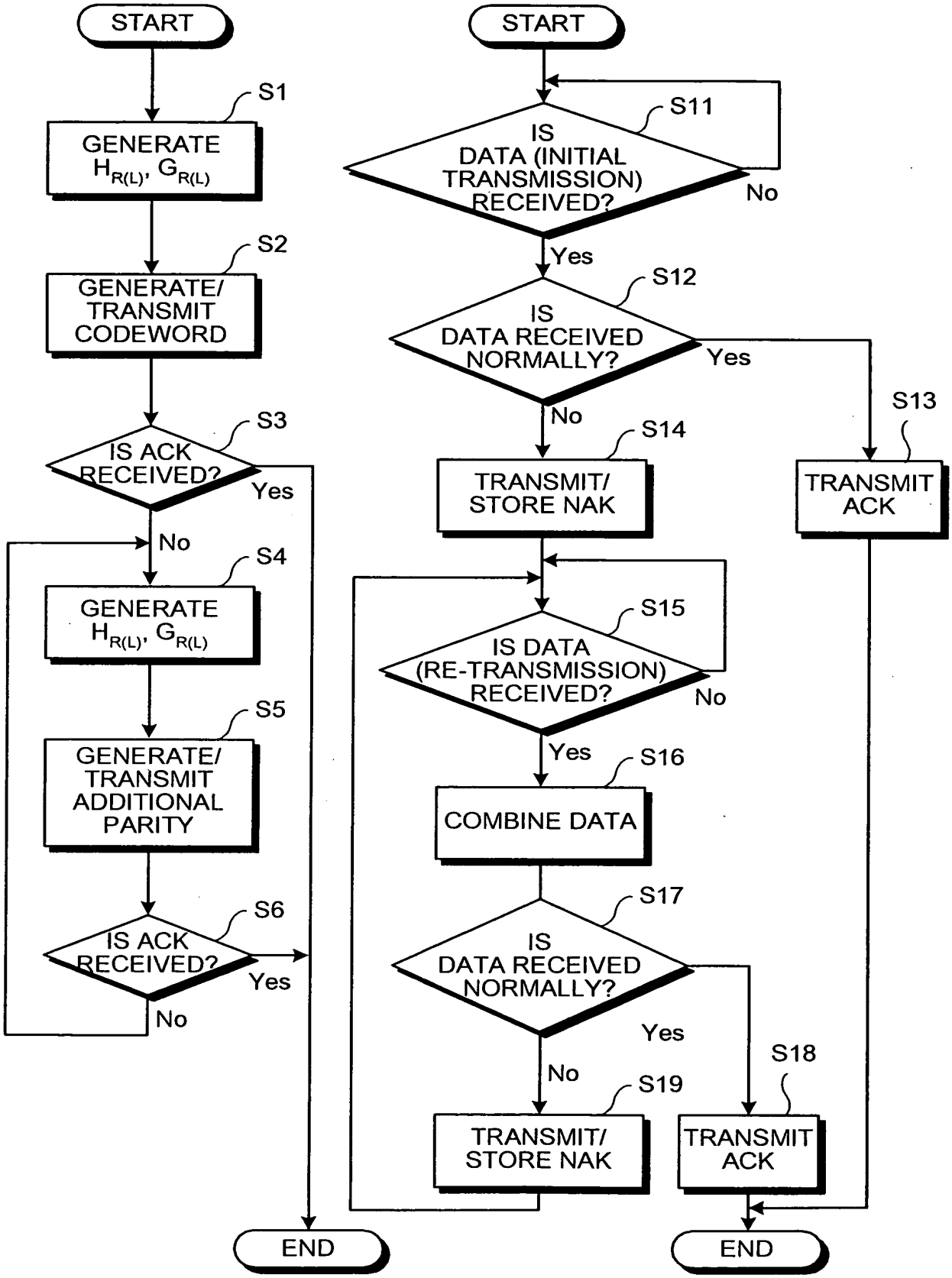

START
S1
GENERATE $H_{R(L)}$, $G_{R(L)}$
S2
GENERATE/ TRANSMIT CODEWORD
S3
IS ACK RECEIVED?
Yes
No
S4
GENERATE $H_{R(L)}$, $G_{R(L)}$
S5
GENERATE/ TRANSMIT ADDITIONAL PARITY
S6
IS ACK RECEIVED?
Yes
No
END
START
S11
IS DATA (INITIAL TRANSMISSION) RECEIVED?
No
Yes
S12
IS DATA RECEIVED NORMALLY?
Yes
No
S13
TRANSMIT ACK
S14
TRANSMIT/ STORE NAK
S15
IS DATA (RE-TRANSMISSION) RECEIVED?
No
Yes
S16
COMBINE DATA
S17
IS DATA RECEIVED NORMALLY?
Yes
No
S18
TRANSMIT ACK
S19
TRANSMIT/ STORE NAK
END

FIG.2

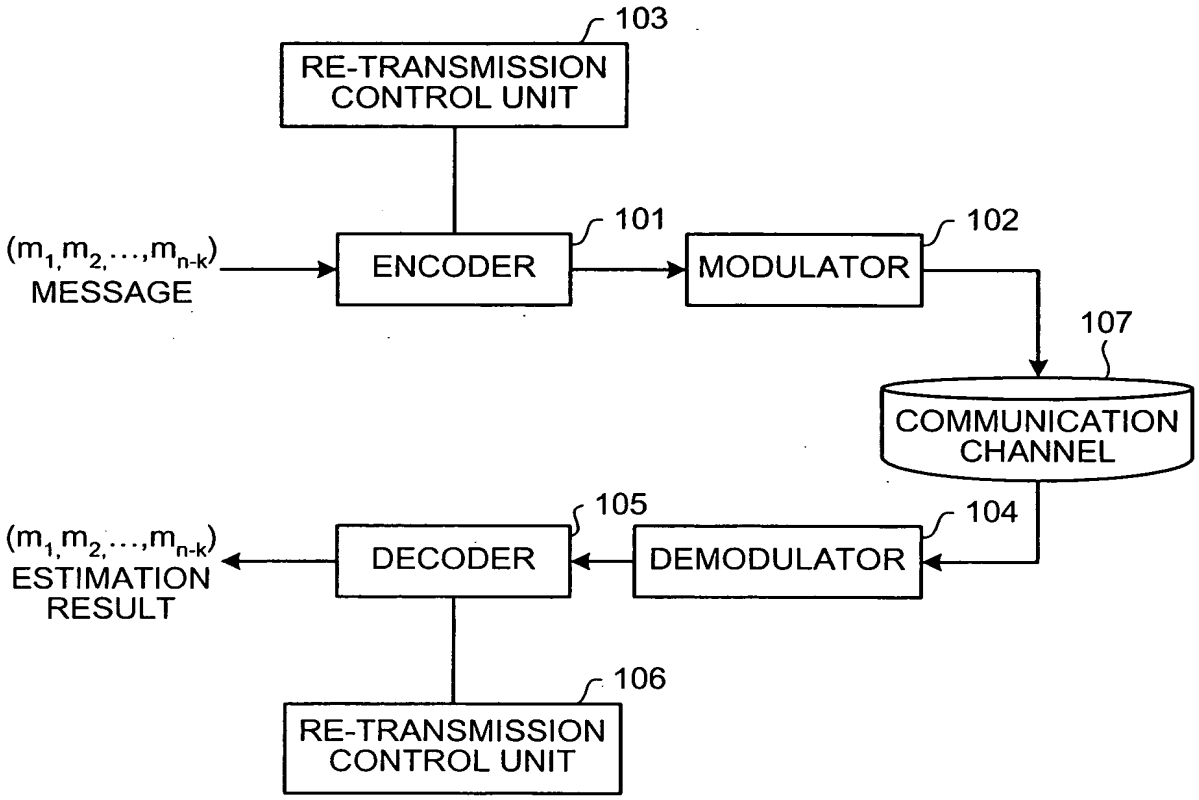

103
RE-TRANSMISSION CONTROL UNIT
$(m_1, m_2, \ldots, m_{n-k})$
MESSAGE
ENCODER
101
MODULATOR
102
107
COMMUNICATION CHANNEL
105
104
$(m_1, m_2, \ldots, m_{n-k})$
ESTIMATION RESULT
DECODER
DEMODULATOR
106
RE-TRANSMISSION CONTROL UNIT

FIG.3

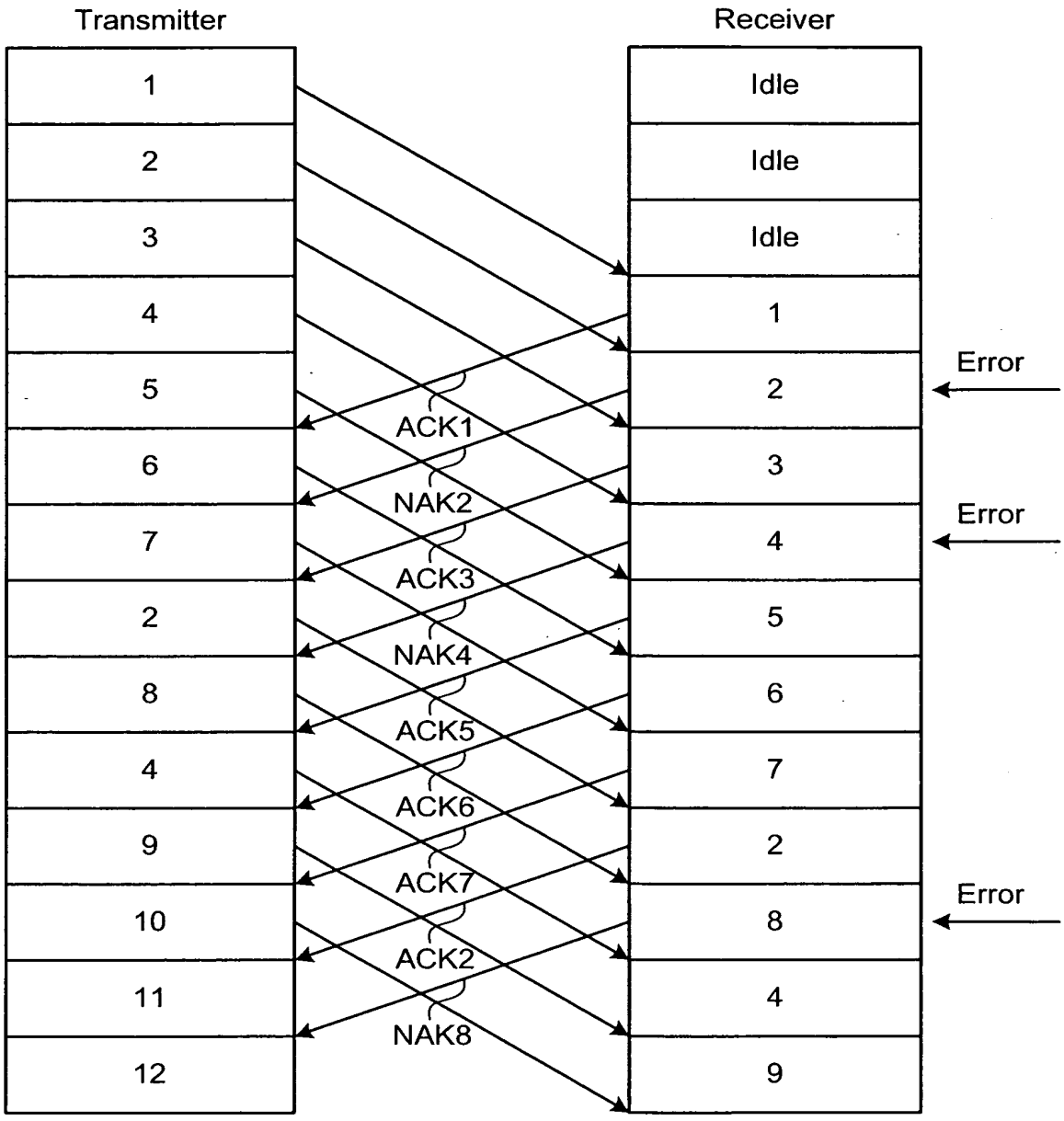

Transmitter
Receiver
1
2
3
4
5
6
7
2
8
4
9
10
11
12
Idle
Idle
Idle
1
2
3
4
5
6
7
2
8
4
9
ACK1
NAK2
ACK3
NAK4
ACK5
ACK6
ACK7
ACK2
NAK8
Error
Error
Error

FIG.4

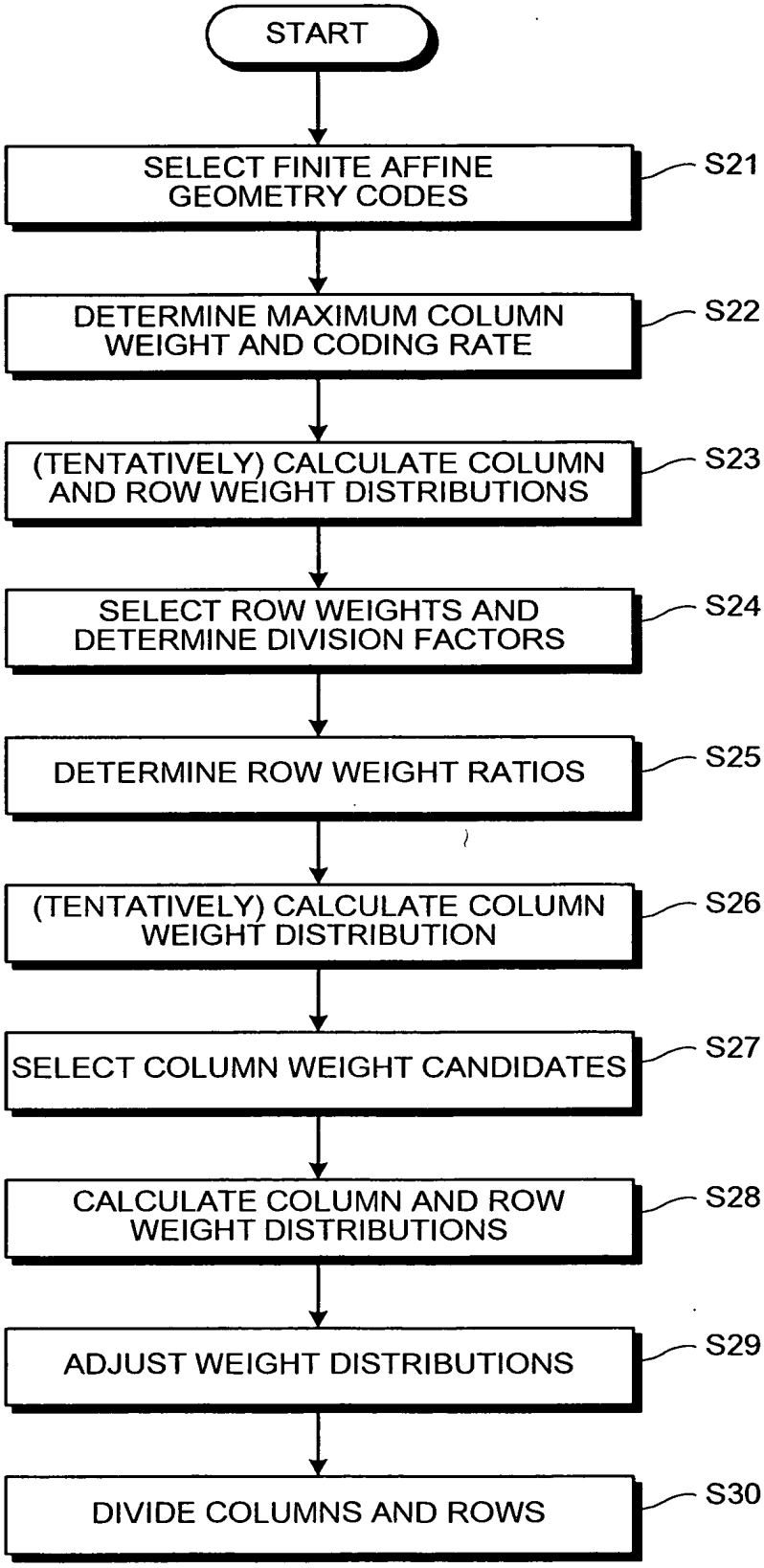

START
SELECT FINITE AFFINE GEOMETRY CODES
S21
DETERMINE MAXIMUM COLUMN WEIGHT AND CODING RATE
S22
(TENTATIVELY) CALCULATE COLUMN AND ROW WEIGHT DISTRIBUTIONS
S23
SELECT ROW WEIGHTS AND DETERMINE DIVISION FACTORS
S24
DETERMINE ROW WEIGHT RATIOS
S25
(TENTATIVELY) CALCULATE COLUMN WEIGHT DISTRIBUTION
S26
SELECT COLUMN WEIGHT CANDIDATES
S27
CALCULATE COLUMN AND ROW WEIGHT DISTRIBUTIONS
S28
ADJUST WEIGHT DISTRIBUTIONS
S29
DIVIDE COLUMNS AND ROWS
S30

FIG.5

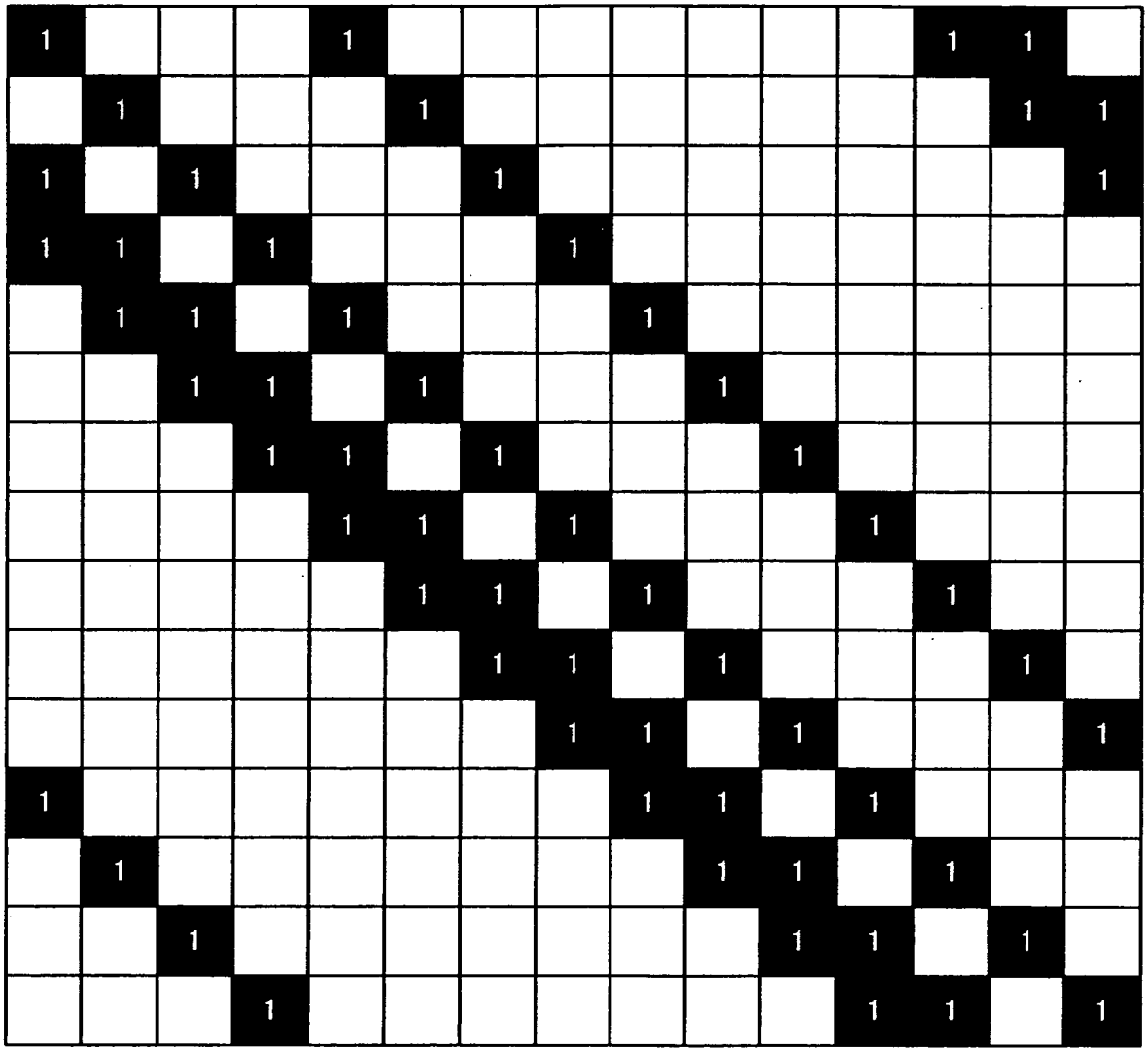

1 1 1

FIG.6

rate		0.5	
N		12.6	
i	γ_i	$\lambda(\gamma_i)$	$n(\gamma_i)$
1	2	0.27381	69
2	3	0.10714	18
3	8	0.61905	39
u		ρ_u	n_u
8		1	63

FIG.7

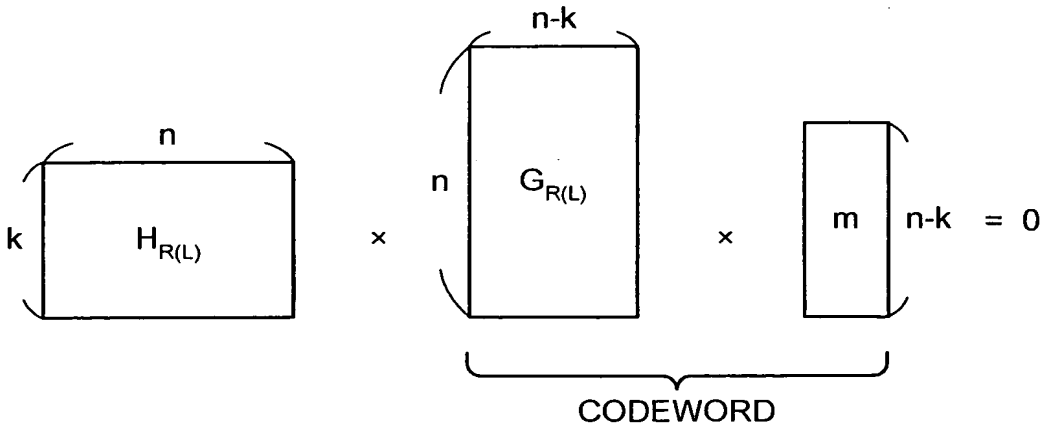


FIG.8

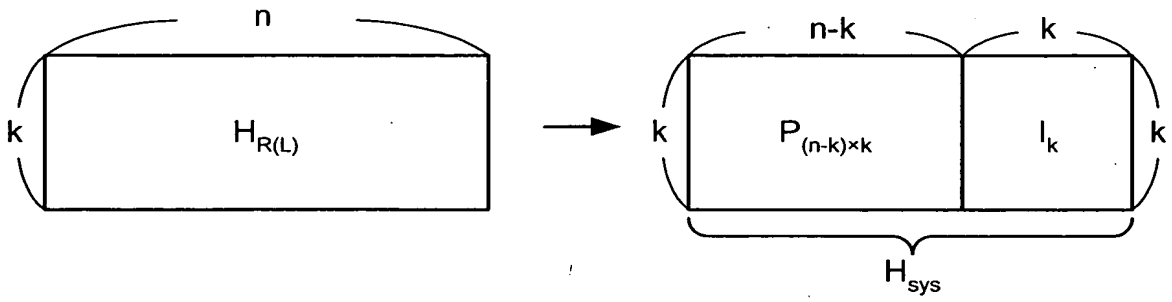

n
k
$H_{R(L)}$
n-k
k
k
$P_{(n-k)\times k}$
I_k
k
H_{sys}

FIG.9

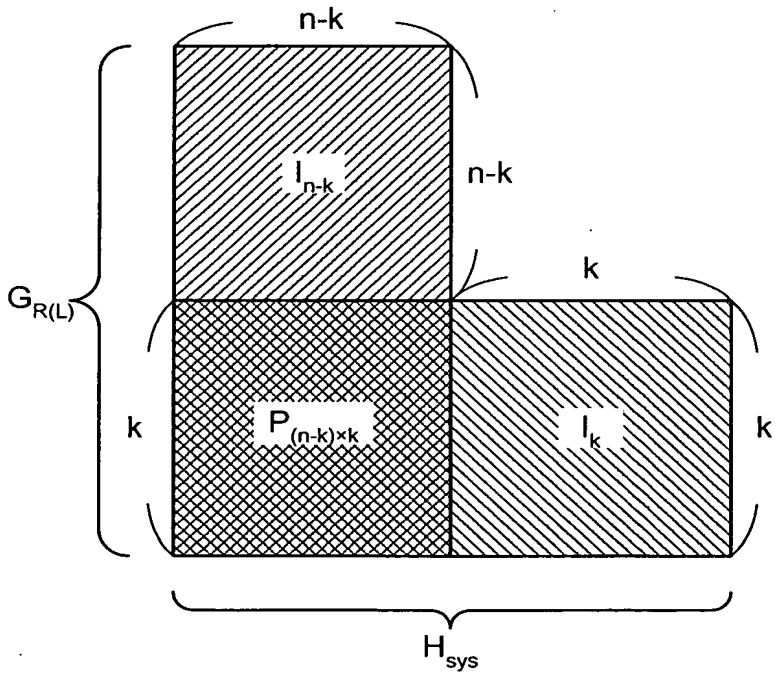
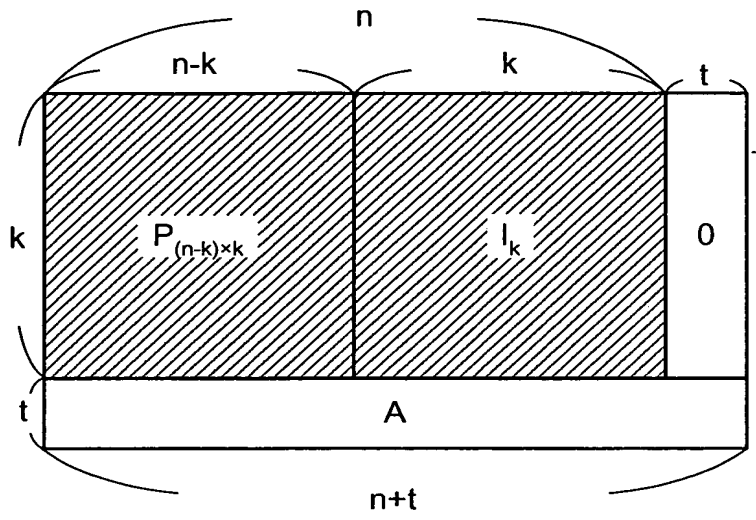
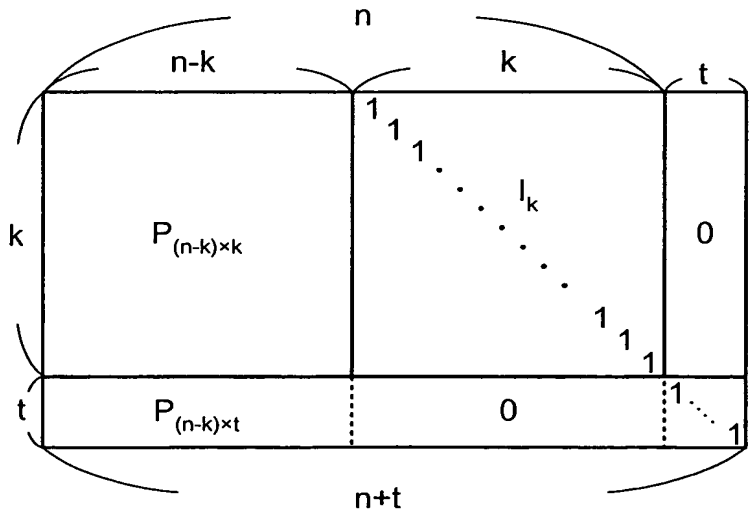

n-k
I_{n-k}
n-k
k
$G_{R(L)}$
k
$P_{(n-k)\times k}$
I_k
k
H_{sys}

FIG.10



PARITY-CHECK MATRIX $H_{R(L)}$ FOR RE-TRANSMISSION (PART INDICATED BY OBLIQUE LINES CORRESPONDS TO INITIAL TRANSMISSION H_{sys})

FIG.11



CHECK MATRIX H_{sys} IN IRREDUCIBLE STANDARD FORM FOR RE-TRANSMISSION ($H_{sys}=[P_{(n-k)\times(k+t)}|I_{k+t}]$)

FIG.12

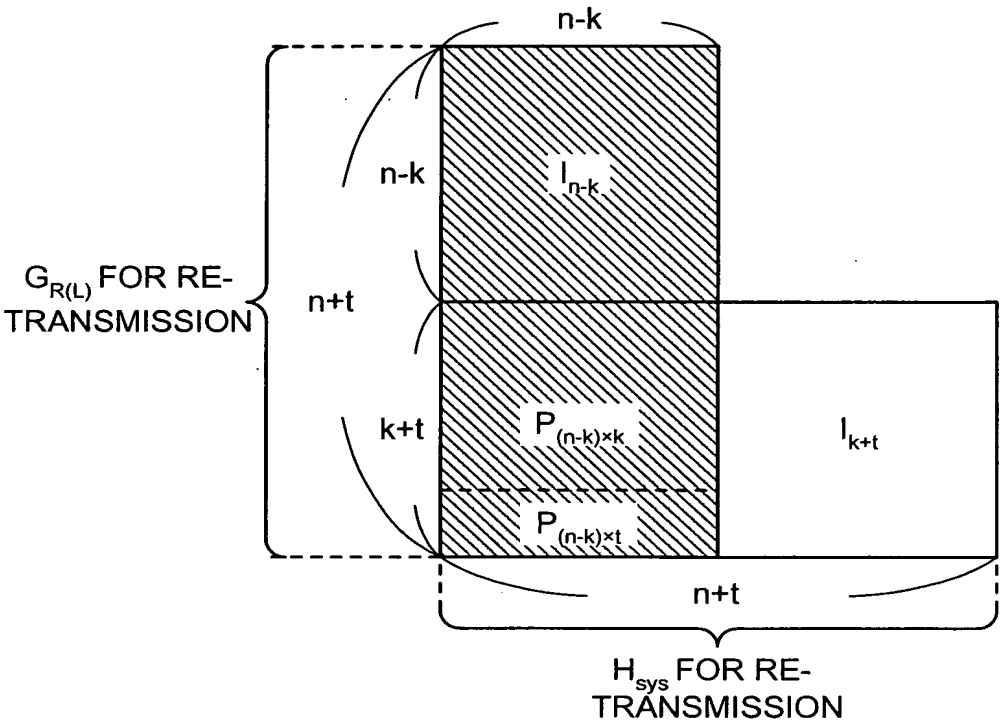
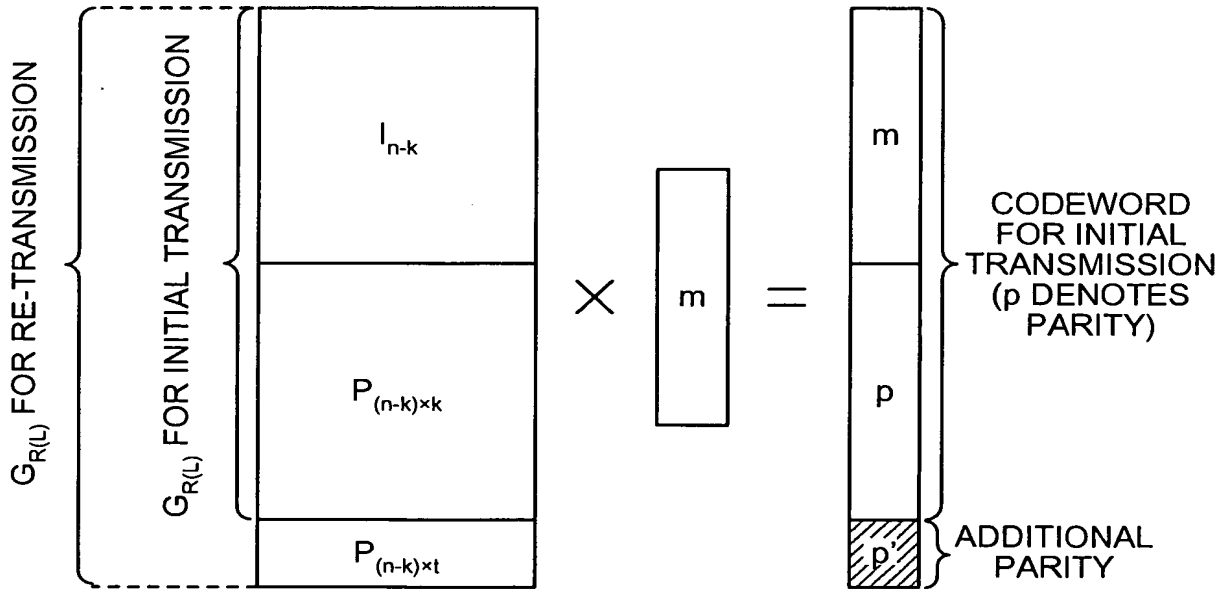

n-k
n-k
I_{n-k}
$G_{R(L)}$ FOR RE-TRANSMISSION
n+t
k+t
$P_{(n-k)\times k}$
I_{k+t}
$P_{(n-k)\times t}$
n+t
H_{sys} FOR RE-TRANSMISSION

FIG.13


$G_{R(L)}$ FOR RE-TRANSMISSION
$G_{R(L)}$ FOR INITIAL TRANSMISSION
I_{n-k}
$P_{(n-k)\times k}$
$P_{(n-k)\times t}$
m
m
p
p'
CODEWORD FOR INITIAL TRANSMISSION (p DENOTES PARITY)
ADDITIONAL PARITY